1/11
Fig 1

SCHEME I

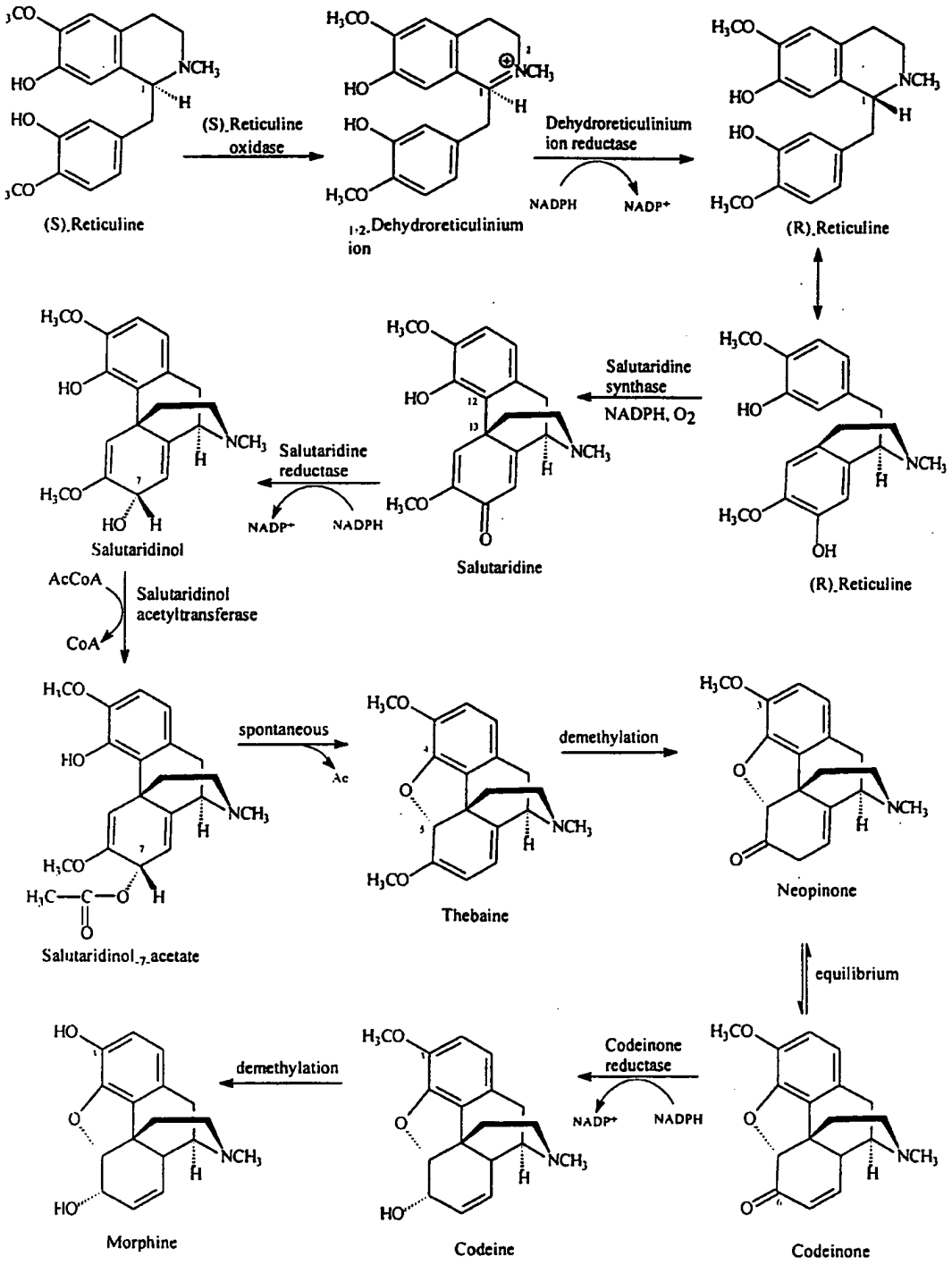


Fig 2

Peptide 3	X L Q E L M A
Peptide 7	V L H Q I A V A R G K
Peptide 14	D D D E L F I T S K
Peptide 16	I P D V V N Q V E M S P T L G Q
Peptide 17	X V N E I P K
Peptide 25	X V A Q V
Peptide 29	I F D N X L T A E D

Fig 3

```
            51                                                  90
Alfalfa     KQGYRHFDTA AAYGSEQALG EALKEAIELG LVTREELFVT
Glycyrrh.   KQGYRHFDTA AAYGSETALG EALKEARDLG LVTREELFVT
Soybean     KQGYRHFDTA AAYGSEQALG EALKEAIHLG LVSRQDLFVT
Opium poppy ..........  ..........  ..........  .....ELFIT

  91                                                        140
  SKLWVTENHP HLVIPALQKS LKTLQLDYLD LYLIHWPLSS QPGKFSFPID
  SKLWVTENHP HLVIPALRKS LETLQLEYLD LYLIHWPLSS QPGKFSFPIQ
  SKLWVTENHP HLVLPALRKS LKTLQLEYLD LYLIHWPLSS QPGKFSFPIE
  SK........  ..........  ..........  ..........  ..........

  141                                                       190
  VADLLPFDVK GVWESMEESL KLGLTKAIGV SNFSVKKLEN LLSVATVLPA
  VEDLLPFDVK GVWESMEECL KLGLTKAIGV SNFSVKKLQN LLSVATIRPA
  VEDLLPFDVK GVWESMEECQ KLGLTKAIGV SNFSVKKLQN LLSVATIRPV
  ..........  ..........  ..........  .......LQE LMA...IPDV

  191                                                       240
  VNQVEMN...  LAWQQKKLRE FCNANGIVLT AFSPLRKGAS RGPNEVMEND
  VNQVEMN...  LAWQQKKLRE FCTANGIVLT AFSPLRKGAS RGPNEVMEND
  VDQVEMN...  LAWQQKKLRE FCKENGIIVT AFSPLRKGAS RGPNEVMEND
  VNQVEMSPTL..........  ..........  ..........  ..........

  241
  MLKEIADAHG KSVAQISLRW LYEQGVTFVP KSYDKERMNQ NLC
  MLKGIAEAHG KSIAQVSLRW LYEQGVTFVA KSYDKERMNQ NLQ
  VLKEIAEAHG KSIAQVSLRW LYEQGVTFVP KSYDKERMNQ NLH
  VLHQIAVARG K.........  .....VNEIP K.........  ...
```

Fig 4

```
cor1.1  .MESNGVPMI TLSSG...IR MPALGMGTAE TMVKGTEREK LAFLKAIEVG
cor1.2  .--------- ---------- --------V- --E------- ----N-----
cor1.3  .--------- ---------- ---------- ---------- ----------
cor1.4  .--------- ---------- ---------- ---------- ----------
6'dcs   MAAAIEI-T- VFPNSSAQQ- --VV---S-P DFTCKKDT.- E-IIE-VKQ-

cor1.1  YRHFDTAAAY QTEECLGEAI AEALQLGLIK SRDELFITSK LWCADAHADL
cor1.2  ---------- -S-------- ---------- ---------- ----------
cor1.3  ---------- -S-------- ---------- ---------- ----------
cor1.4  ---------- -S-------- ---------- ---------- ----------
6'dcs   ---------- GS-QA----L K--IH---VS .-QD-V---- --VTEN-PH-

cor1.1  VLPALQNSLR NLKLDYLDLY LIHHPVSLKP GKFVNEIPKD HILPMDYKSV
cor1.2  ---------- ----E----- ---------- --L------- ----------
cor1.3  ---------- ---------- ---------- ---------- ----------
cor1.4  ---------- ----E----- ---------- ---------- ----------
6'dcs   -----RK--K T-Q-E----- ---W-L-SQ- ---SFP-EVE DL--F-V-G-

cor1.1  WAAMEECQTL GFTRAIGVCN FSCKRLQELM ETANSPPVVN QVEMSPTLHQ
cor1.2  ---------- --------S- ----K----- A--KI----- ----------
cor1.3  ---------- ---------- ----K----- AA-KI----- ----------
cor1.4  ---------- --------S- ----K----- AA-KI----- ----------
6'dcs   -ES-----K- -L-K----S- --V-K--N-L SV-TIR---D ----NLAWQ-

cor1.1  KNLREYCKAN NIMITAHSVL GAVGAAWGTN AVMHSKVLHQ IAVARGKSVA
cor1.2  ---------- ---------- --I--P--S- ---D------ ----------
cor1.3  ---------- ---------- --IC-P--S- ---D------ ----------
cor1.4  ---------- ---------- --I--P--S- ---D------ ----------
6'dcs   -K---F--E- G-IV--F-P- .RK--SR-P- E--END--KE --E-H---I-

cor1.1  QVSMRWVYQQ GASLVVKSFN EARMKENLKI FDWELTAEDM EKISEIPQSR
cor1.2  ---------- ---------- ---------- --S------- ----------
cor1.3  ---------- ---------- -G-------- --------N- ----------
cor1.4  ---------- ---------- -G-------- ---------- ----------
6'dcs   ---L--L-E- -VTF-P--YD KE--NQ--H- ---A--EQ-H H---Q-S---

cor1.1  TSSAAFLLSP TGPFKTEEEF WDEKD
cor1.2  ----D----- ---------- -----
cor1.3  ----D----- ---------- -----
cor1.4  ---------- ---------- -----
6'dcs   .....LISG- -K-..QLADL --DQI
```

FIGURE 5

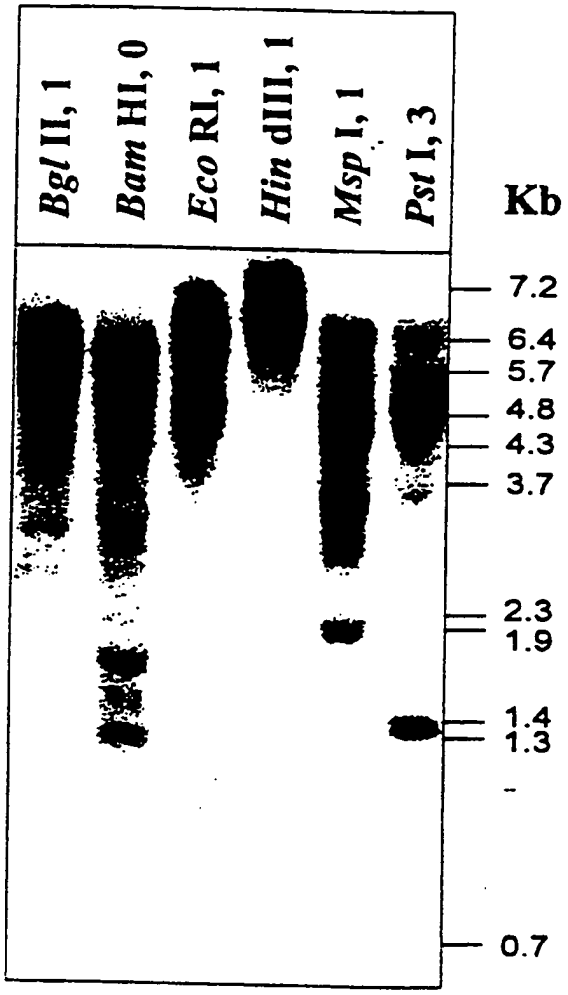


FIGURE 6

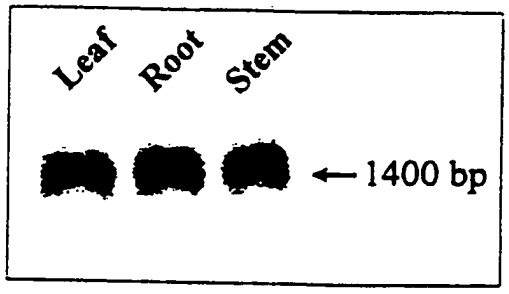


FIGURE 7

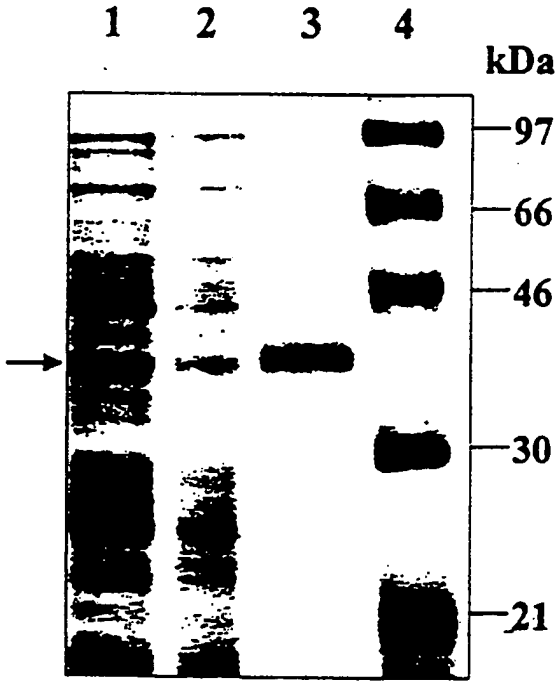


FIGURE 8

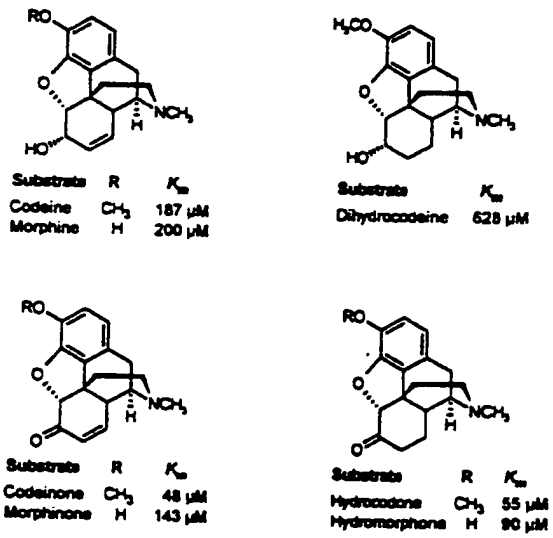
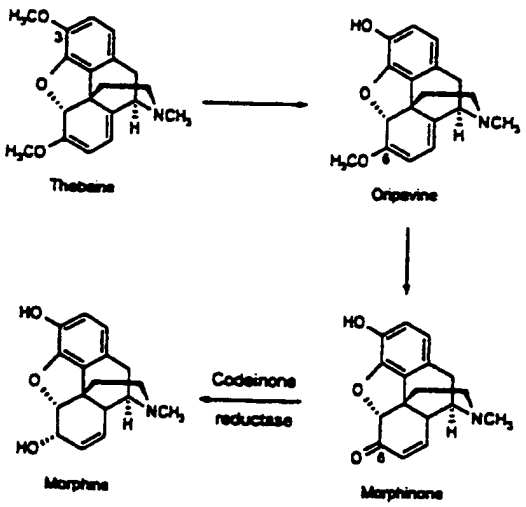

RO
O
NCH3
H
HO
Substrate R Km
Codeine CH3 187 µM
Morphine H 200 µM
H3CO
O
NCH3
H
HO
Substrate Km
Dihydrocodeine 628 µM
RO
O
NCH3
H
O
Substrate R Km
Codeinone CH3 48 µM
Morphinone H 143 µM
RO
O
NCH3
H
O
Substrate R Km
Hydrocodone CH3 55 µM
Hydromorphone H 90 µM

FIGURE 9


Thebaine
Oripavine
Morphine
Codeinone reductase
Morphinone

cor1.1
cds6-971

Fig 10

GAAAAATGGAGAGTAATGGTGTACCTATGATCACTCTCAGTTCCGGCATTCGGATGCCTGCTTTAGGTATGGGAA
CAGCTGAAACAATGGTAAAAGGAACAGAAAGAGAGAAATTGGCGTTTTTGAAAGCGATAGAGGTCGGTTACAGAC
ACTTCGATACAGCTGCTGCATACCAAACTGAAGAGTGTCTTGGTGAAGCTATAGCTGAAGCACTTCAACTTGGTC
TAATAAAATCTCGAGATGAACTCTTCATCACTTCCAAGCTCTGGTGCGCTGATGCTCACGCTGATCTTGTCCTCC
CTGCTCTTCAGAATTCTCTGAGGAATCTTAAATTGGACTATCTTGATCTATATTTGATACACCATCCGGTAAGCT
TGAAGCCAGGGAAGTTTGTTAACGAAATACCAAAGGATCATATCCTTCCAATGGACTACAAATCTGTATGGGCAG
CCATGGAAGAGTGTCAGACCCTTGGCTTCACTAGGGCAATCGGGGTCTGTAATTTCTCATGCAAAAGGCTTCAAG
AGTTGATGGAAACAGCCAACAGCCCTCCAGTTGTGAATCAAGTGGAGATGAGCCCGACTTTACATCAAAAAAATC
TGAGGGAATATTGCAAGGCCAATAATATCATGATCACCGCACACTCAGTTTTGGGAGCCGTAGGTGCCGCCTGGG
GCACCAATGCAGTTATGCATTCTAAGGTGCTTCACCAGATTGCTGTGGCCAGAGGAAAATCTGTTGCCCAGGTTA
GTATGAGATGGGTTTACCAGCAAGGCGCGAGTCTTGTGGTGAAAAGTTTCAATGAAGCGAGGATGAAGGAAAACC
TTAAGATATTTGATTGGGAACTAACGGCAGAAGACATGGAAAAGATCAGTGAGATTCCACAATCTAGAACAAGCT
CTGCTGCTTTCTTGTTATCACCGACTGGACCTTTCAAAACTGAAGAAGAGTTCTGGGATGAGAAGGATTGAAACA
TCAATTATAGATGGTAAGTGAGGACTGTCAAAAAAGTAATCAGTTTTTCCCTCCGTTTTG

cor1.2
cds 1-966

Fig 11

ATGGAGAGTAATGGTGTACCTATGATCACTCTCAGTTCCGGCATTCGGATGCCTGCTTTAGGTATGGGAACAGTT
GAAACAATGGAAAAGGGAACAGAAAGAGAGAAATTGGCGTTTTTGAATGCGATAGAGGTCGGTTACAGACACTTC
GATACAGCTGCTGCATACCAAAGTGAAGAGTGTCTTGGTGAAGCTATAGCTGAAGCACTTCAACTTGGTTTAATA
AAATCTCGAGATGAACTCTTCATCACTTCCAAGCTCTGGTGCGCTGATGCTCACGCTGATCTTGTCCTCCCTGCT
CTTCAGAATTCTCTGAGGAATCTCAAATTGGAGTACCTTGATCTATATTTGATACACCATCCGGTAAGCTTGAAG
CCAGGGAAGCTTGTTAACGAAATACCAAAGGATCATATTCTTCCAATGGACTACAAATCTGTATGGGCAGCCATG
GAAGAGTGTCAGACCCTTGGCTTCACTAGGGCAATCGGTGTCAGTAATTTCTCATGCAAAAAGCTTCAAGAGTTG
ATGGCAACAGCCAAGATCCCTCCAGTTGTGAATCAAGTGGAGATGAGCCCGACTTTACATCAAAAAAATCTGAGG
GAATATTGCAAGGCCAATAATATCATGATCACTGCACACTCGGTTTTGGGAGCCATAGGTGCTCCATGGGGCAGC
AACGCAGTTATGGATTCTAAGGTGCTTCACCAGATTGCTGTGGCAAGAGGAAAATCTGTTGCCCAGGTTAGTATG
AGATGGGTTTACCAGCAAGGCGCGAGTCTTGTGGTGAAAAGTTTCAATGAAGCGAGGATGAAGGAAAACCTTAAG
ATATTTGATTCGGAACTAACGGCAGAAGATATGGAAAAGATCAGTGAGATTCCGCAATCTAGAACAAGCTCTGCT
GATTTCTTGTTATCACCGACTGGACCTTTCAAAACTGAAGAAGAGTTCTGGGATGAGAAGGATTGA

cor1.3
cds1-966

Fig 12

ATGGAGAGTAATGGTGTACCTATGATCACTCTCAGTTCCGGCATTCGGATGCCTGCTTTAGGTATGGGAACAGCT
GAAACAATGGTAAAAGGAACAGAAAGAGAGAAATTGGCGTTTTTGAAAGCGATAGAGGTCGGTTACAGACACTTC
GATACAGCTGCTGCATACCAAAGTGAAGAGTGTCTTGGTGAAGCTATAGCTGAAGCACTTCAACTTGGTCTAATA
AAATCTCGAGATGAACTCTTCATCACTTCCAAGCTCTGGTGCGCTGATGCTCACGCTGATCTTGTCCTCCCTGCT
CTTCAGAATTCTCTGAGGAATCTTAAATTGGACTATCTTGATCTATATTTGATACACCATCCGGTAAGCTTGAAG
CCAGGGAAGTTTGTTAACGAAATACCAAAGGATCATATCCTTCCAATGGACTACAAATCTGTATGGGCAGCCATG
GAAGAGTGTCAGACCCTTGGCTTCACTAGGGCAATCGGGGTCTGTAATTTCTCATGCAAAAAGCTTCAAGAGTTG
ATGGCAGCAGCCAAGATCCCTCCAGTTGTGAATCAAGTGGAGATGAGCCCGACTTTACATCAAAAAAATCTGAGG
GAATATTGCAAGGCCAATAATATCATGATCACTGCACACTCGGTTTTGGGAGCCATATGTGCTCCATGGGGCAGC
AATGCAGTTATGGATTCTAAGGTGCTTCACCAGATTGCTGTGGCAAGAGGAAAATCTGTTGCCCAGGTTAGTATG
AGATGGGTTTACCAGCAAGGCGCGAGTCTAGTGGTGAAAAGTTTCAATGAAGGGAGGATGAAGGAAAACCTTAAG
ATATTTGATTGGGAACTAACGGCAGAGAATATGGAAAAGATCAGTGAGATTCCGCAATCTAGAACAAGCTCTGCT
GATTTCTTGTTATCACCGACTGGACCTTTCAAAACTGAAGAAGAGTTCTGGGATGAGAAGGATTGA

cor1.4
cds1-966

Fig 13

ATGGAGAGTAATGGTGTACCTATGATCACTCTCAGTTCCGGCATTCGGATGCCTGCTTTAGGTATGGGAACAGCT
GAAACAATGGTAAAAGGAACAGAAAGAGAGAAATTGGCGTTTTTGAAAGCGATAGAGGTCGGTTACAGACACTTC
GATACAGCTGCTGCATACCAAAGTGAAGAGTGTCTTGGTGAAGCTATAGCTGAAGCACTTCAACTTGGTTTAATA
AAATCTCGAGATGAACTCTTCATCACTTCCAAGCTCTGGTGCGCTGATGCTCACGCTGATCTTGTCCTCCCTGCT

CTTCAGAATTCTCTGAGGAATCTCAAATTGGAGTATCTTGATCTATATTTGATACACCATCCGGTAAGCTTGAAG
CCAGGGAAATTTGTTAACGAAATACCAAAGGATCATATTCTTCCAATGGACTACAAATCTGTATGGGCAGCCATG
GAAGAGTGTCAGACCCTTGGCTTCACTAGGGCAATCGGTGTCAGTAATTTCTCATGCAAAAAGCTTCAAGAGTTG
ATGGCAGCAGCCAAGATCCCTCCAGTTGTGAATCAAGTGGAGATGAGCCCTACTTTACATCAAAAAAATCTGAGG
GAATATTGCAAGGCCAATAATATCATGATCACTGCACACTCGGTTTTGGGAGCCATAGGTGCTCCATGGGGCAGC
AATGCAGTTATGGATTCTAAGGTGCTTCACCAGATTGCTGTGGCAAGAGGAAAATCTGTTGCCCAGGTTAGTATG
AGATGGGTTTACCAGCAAGGCGCGAGTCTTGTGGTGAAAAGTTTCAATGAAGGGAGGATGAAGGAAAACCTTAAG
ATATTTGATTGGGAACTAACGGCAGAAGATATGGAAAAGATCAGTGAGATTCCGCAATCTAGAACAAGCTCTGCT
GCTTTCTTGTTATCACCGACTGGACCTTTCAAAACTGAAGAAGAGTTCTGGGATGAGAAGGATTGA

corl.5
partial seq

Fig 14

TGTGGTGAATCAGGTGGAGATGTGGCCGACTTTACATCAAAAAAATCTGAGGGAATATTGCAAGGCCAATAATAT
CATGATCACTGCACACTCGGTTTTGGGAGCCATAGGTGCTCCATGGGGCAGCAATGCAGTTATGGATTCTAAGGT
GCTT

corl.6
partial seq

Fig 15

CTCTGGTGCGCTGATGCTCACGCTGATCTTGTCCTCCCTGCTCTTCAGAATTCTCTGAGGAATCTCAAATTGGAC
TACCTTGATCTATATTTGATACACCATCCGGTAAGCTTGAAGCCAGGGAAGCTTGTTAACGAAATACCAAAGGAT
CATATTCTTCCAATGGACTACAAATCTGTATGGGCAGCCATGGAAGAGTGTCAGACCCTTGGCTTCACTAGGGCA
ATCGGTGTCAGTAATTTCTCATGCAAAAAGCTTCAAGAGTTGATGGCAACAGCCAAGATCCCTCCA